City of Salina Raw Water Supply Study

Citizen's Advisory Board Workshop

January 5, 2009
6:00 PM

Introductions

- City Staff
  - Martha Tasker, Director of Utilities
  - Kurt Williams, Plant Operations Manager
  - Jeff Cart, Utilities Superintendent
  - Steve Palmer, Utility Engineer

- Consultants
  - HDR
    - Donald Lindeman, Project Manager
    - Lorrie Hill, Project Engineer
  - Wilson & Company
    - Jason Schlickbernd, Asst. Project Manager
    - Melissa Schlickbernd, Project Engineer
  - Layne Christensen
    - Luca DeAngelis Hydrogeologist

Questions?
Contact: **Martha Tasker**
Phone: **785-309-5725**
E-Mail: **martha.tasker@salina.org**

Agenda for Tonight

- Review of Study Objectives
  - Purpose of Citizens Advisory Board
  - Scope of the Raw Water Supply Study
- Recap of last CAB meeting
  - Answer CAB members questions
- Water Conservation Plan
- Potential Water Conservation Measures
  - Rating Worksheet
- Water Reuse

Raw Water Supply Study

- Purpose of Study
  - Recent drought conditions
  - Contamination issues near wellfields
  - Strained ability of City to maintain adequate water supply for customers
  - Identify sustainable solutions for next 50 years
  - Diversify water supply sources
- CAB meetings at key project milestones
  - August, 2008 - Demand projections, water rights
  - November, 2008 – Future regulatory impacts, existing facilities
  - January, 2009 (early) - Conservation, reuse
  - January, 2009 (late) – Alternatives
  - March, 2009 – Draft Report

Recap of Last CAB Meeting

- Primary goal - maximize the existing infrastructure and supply sources
  - Redrill wells at Downtown Wellfield to maximize water right
  - Implement treatment at South Wellfield and redrill two wells
  - Maximize use of river water during off-season times
    - Preserves aquifer levels
  - Groundwater recharge
    - Passive – maximize use of river water during off-season time
    - Active – utilize existing oxbow to infiltrate water near Downtown Wellfield

Answer Questions from CAB Members

- TM 2 Water Rights and Regulatory Review
- TM 3 Existing Sources of Supply

Water Conservation Plan

Water Conservation Plan

- Requirement under Kansas Statutes
- Existing Plan adopted in 1997
  - Based on 1990 Kansas Water Office (KWO) Guidelines
- Contents of a Water Conservation Plan
  - Includes a water use efficiency goal (in gallons per capita per day)
  - Lists current and proposed water conservation practices (education, management and regulation)
  - Drought/Emergency Contingency Plan
    - Water Watch (voluntary)
    - Water Warning (restriction)
    - Water Emergency (prohibition)

Water Conservation Plan (continued)

- Current Requirements (2007 KWO Guidelines)
  - Highly recommended efficient water use practices
    - Water bills show amount of water used in gallons
    - All meters be repaired and replaced regularly
  - Private wells may be included in drought response if approved by the Chief Engineer of Division of Water Resources (DWR)
- Recommended Modifications to Existing Plan
  - Water use efficiency goal be reduced from 140 gallons per capita per day (gpcd) to 126 gpcd
  - Include private wells within the city limits in the drought response
  - Modify the trigger points for Water Watch, Water Warning and Water Emergency

Water Conservation Plan (continued)

- Water Watch
  - Triggered by one of the following
    - Treatment plant at 75 percent capacity for 3 consecutive days
    - Groundwater levels at ~~5~~ 2 feet below normal seasonal level
    - Smoky Hill River flows are below ~~45~~ 50 cfs
    - Emergency conditions related to repairs or water quality
  - Regulation Actions (includes private wells)
    - Public asked to curtail outdoor water use and make efficient use of indoor water

Water Conservation Plan (continued)

- Water Warning
  - Triggered by one of the following
    - Treatment plant at 90 percent capacity for 3 consecutive days
    - Groundwater levels at ~~10~~ 4 feet below normal seasonal level
    - Smoky Hill River flows are below ~~30~~ 35 cfs
    - Emergency conditions related to repairs or water quality
  - Regulation Actions (includes private wells)
    - ~~Odd/even water system~~ Allowed to water twice per week (zoned watering system)
    - Commercial/Industrial owners allowed to preserve vegetation per landscaping ordinance
    - Refilling of pools allowed one day a week after sunset
    - Emergency water rates may be imposed (double the current rate)
    - Home outdoor washing of vehicles allowed once per week (Saturdays only)

Water Conservation Plan (continued)

- Water Emergency
  - Triggered by one of the following
    - Treatment plant at 100 percent capacity for 3 consecutive days
    - Groundwater levels at ~~15~~ 6 feet below normal seasonal level
    - Smoky Hill River flows are below ~~15~~ 25 cfs
    - Emergency conditions related to repairs or water quality
  - Regulation Actions (includes private wells)
    - Outdoor water use will be banned
    - Emergency water rates may be imposed (double the current rate)

Impact of Private Wells

Impact of Private Wells

- The City does not currently have authority to restrict water use from private wells
- Only Chief Engineer at DWR has that authority
- Under 2007 KWO Guidelines for Water Conservation Plans, private wells required to implement water conservation measures when:
  - Impairment to senior water rights is occurring
  - A municipality with a common source of supply is experiencing a period of drought and water watch, warning or emergency is in place
  - Waste of water is occurring

Impact of Private Wells (continued)

- DWR recommends regulating private wells based on waste of water condition
  - Watering during afternoon hours = high evaporation, low humidity, and high winds = higher percentage of loss than that actually put to beneficial use = waste of water
- City's current ordinance
  - Prohibits customer's of the water distribution system from outdoor watering between the hours of 10:00am and 6:00pm between June 1 and September 30
- Proposed Revised Ordinance
  - Includes all private wells within the City Limits under Waste of Water condition
  - Highly recommend a public meeting to inform citizens

Water Conservation Measures

Water Conservation Measures

- City currently has a few water conservation measures in place
- Review comprehensive list of potential water conservation measures
  - Complete rating worksheet
  - Review Top 10 water conservation measures after rating results are compiled

Water Conservation Rate Structure

Water Conservation Rate Structure

- Higher water rates lead to lower water consumption (customers respond to price)
- City's rate structure used to be 'more water used = cheaper rate' (does not promote conservation)
- City recently revised rate structure to promote water conservation
  - Excess Use Rate Structure
  - Based on Excess Use Baseline
    - Greater of 120% of Winter Quarter Average or 120% of Minimum Winter Quarter Average (800 cubic feet)

Water Conservation Rate Structure (cont'd)

- Recommended Modifications
  - Evaluate effectiveness of current rate structure
  - If necessary, promote further conservation by
    - Eliminate Excess Use Baseline and Minimum Winter Quarter Average and base excess use charge on 120% of Winter Quarter Average
    - Utilize a portion of revenue from excess use rate to fund water conservation measures
    - Raise rates to fund proposed improvements for future raw water supply improvements

Water Loss Analysis

Water Loss Analysis

- Total Raw Water Diverted – Water Sold = Water Loss
- Sources of Water Loss
  - Water main breaks and leakage
  - High pressure in system which leads to breaks
  - Fire fighting
  - Water main flushing
  - Meter under registration
  - Theft of water

Water Loss Analysis (continued)

- Fairly consistent and reasonable
- Potential additional measures to further decrease percent water loss
  - Scheduled replacement of aged or deteriorated water mains
  - Improved system pressure management
  - Directional water main flushing
  - Improve meter maintenance program

Year	Raw Water Diverted (MG)	Unaccounted for Water (MG)	% Water Loss (%)
2001	2,445	252	10.3
2002	2,708	370	13.7
2003	2,460	306	12.4
2004	2,363	301	12.7
2005	2,406	269	11.2
2006	2,422	347	14.3
2007	2,288	259	11.3
		MINIMUM	10.3
		AVERAGE	12.3
		MAXIMUM	14.3

Demand Impacts from Water Conservation

Demand Impacts from Water Conservation

- Water Conservation could yield up to a 5% reduction in average daily per capita water usage
- This reduction will only delay the need for additional water supply
- Water reuse and water supply source alternatives should still be evaluated

Water Reuse

Types of Water Reuse

- Agricultural Irrigation (crops)
- Landscape Irrigation
  - Parks, athletic fields, golf courses
- Non-Potable Urban Use
  - Fire protection, toilet flushing, dust control, street sweeping
- Industrial Recycling
  - Cooling water, process water
- Groundwater Recharge
- Potable Reuse
  - Blending with water supply, direct (pipe-to-pipe) reuse

State Regulations

- KS Dept of Health & Environment (KDHE)
- Design criteria for irrigation use
  - See next slide
- Revise existing National Pollutant Discharge Elimination (NPDES) permit
  - Water quality limitations
  - Special conditions for irrigation (examples)
    - Irrigate at times when public access is restricted
    - Avoid runoff onto adjacent lands
    - Signage warning of reclaimed wastewater
    - Prevent ponding on ground surface

KDHE Design Criteria

Projected Use of Effluent	Minimum Required Treatment Level	Loading Rates for All Uses
Athletic fields, highway rest areas, or public parks with a high probability of body contact	Secondary Treatment Filtration Disinfection	• Maximum daily application rate of 3 inches per day per acre • Maximum annual application rate of 40 inches per acre • Based on soil and crop moisture and/or nutrient requirements
Golf courses or public parks with a low probability of body contact	Secondary Treatment Disinfection	
Airfields, farmland, and other properties owned or leased by the municipality	Secondary Treatment	
Farmland and properties not owned or leased by the municipality	Secondary Treatment	

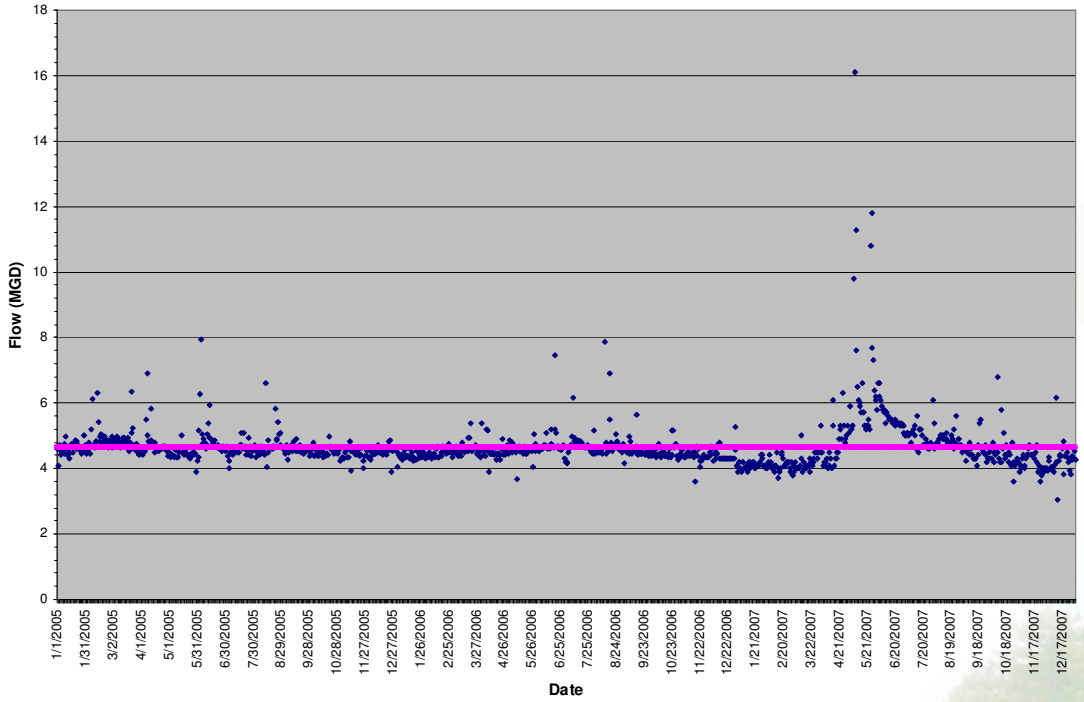
Salina's Existing WWTP – Secondary Treatment + Disinfection

Impacts to Downstream Water Rights

- Water rights regulated by Division of Water Resources (DWR)
- Who has the rights to the water that is normally discharged from the WWTP?
- City has rights to the water under these conditions:
  - It remains under the City's control
  - It is reused within their jurisdictional boundaries
- Does not mean that legal disputes could not occur in the future
  - Has not happened yet it Kansas
  - Downstream users can claim "injury" to water rights
- One irrigation user downstream of Salina before confluence with Saline River

Wastewater Effluent Quantity

- Flow into wastewater treatment plant varies:
  - Hourly, Daily, Seasonally
- Always some base flow into WWTP
- Minimum flow (2005-2007) – 3.0 MGD



Wastewater Effluent Quality

- Industrial use – suitability varies by industry
- Irrigation use – some potential concerns
  - Salinity
    - Affects plant's ability to uptake water
    - Burn leaf tissue
  - Sodium
    - Leads to breakdown of soil/reduced infiltration rates
    - Turf grass not particularly sensitive to sodium
  - Chlorides
    - Water softeners contribute chlorides to wastewater
    - Turf grass not particularly sensitive to sodium, ornamental plants are
- Nutrients in wastewater effluent may decrease fertilizer requirements

Reuse Applications – Municipal/Irrigation

- Well-practiced in Kansas
  - Hays, Colby, Hutchinson, others
- Public parks, athletic fields, golf courses, other municipal uses

Water User	2006 Water Usage (gallons)
Bill Burke Park (City of Salina)	13,121,000
Soccer Complex (City of Salina)	10,093,000
Wastewater Treatment Plant (City of Salina)	7,121,000
Salina Municipal Golf Course (City of Salina)	3,677,000
Salina Country Club	3,571,000
Elks Country Club	2,077,000
East Crawford Recreational Area (City of Salina)	1,171,000
Annual TOTAL	32,974,000 gallons
Daily TOTAL (over 120 days per year)	270,000 gpd (0.27 MGD)

(1) Includes minimal potable water use unless otherwise specified
(2) Usage high in 2006 due to new turf. Irrigation of established turf in the future is assumed to be approximately 1,600,000 gallons per year (comparable to other similarly sized parcels).

Reuse Applications – Industrial

- Manufacturing processes
- Some industries may currently treat water further
  - Further evaluation needed to determine if industries can use reclaimed water
  - Most industries not located near WWTP
  - Not considered further

Location	Industry	2006 Water Usage (1) (gallons)
Exide Corporation	Automotive Batteries	44,270,000
Philips Lighting Co.	Fluorescent Lighting	42,416,000
Metlcast Products	Gray/Ductile Iron Foundry	4,652,000
Great Plains Manufacturing	Agricultural Equipment	4,452,000
El Dorado National	Motor Vehicle Bodies	3,150,000
Annual TOTAL		98,940,000 gallons
Daily TOTAL (over 260 days per year) (2)		380,540 gpd (0.38 MGD)

(1) Includes minimal potable water use unless otherwise specified
(2) Assumes 5 working days per week

Reuse Applications – Groundwater Recharge

- Artificial recharge of aquifer
  - Recharge ponds, old river oxbow
  - Direct injection wells
- Federal guidelines
  - Drinking water standards
  - Minimum time retained in aquifer
  - Setback distances from wells
- Technical/Non-Technical Hurdles
  - “Yuck” factor/perceived contamination
  - Potential for build-up of chlorides – would require advanced water treatment processes
  - Inability of the aquifer to retain the water – eventually discharged back to river

Reuse Applications – Direct Reuse

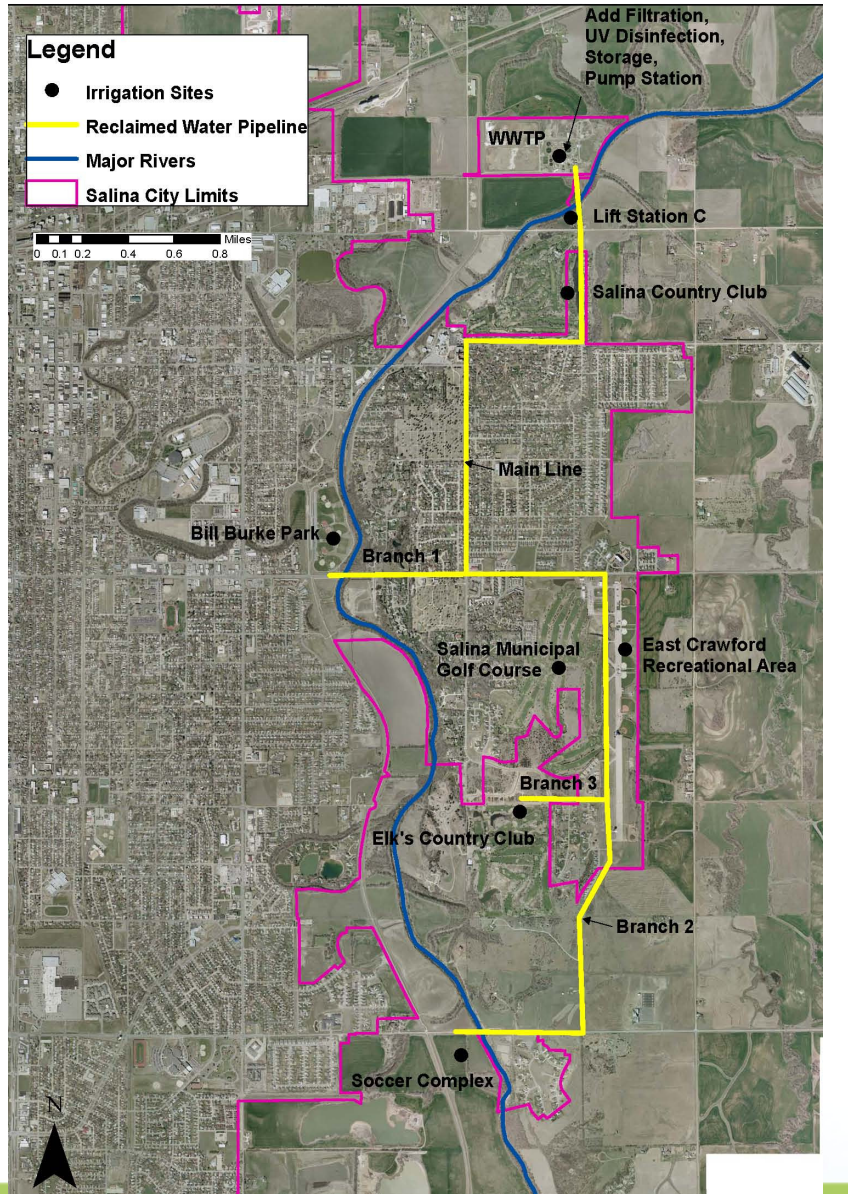
- Reuse for potable water purposes
  - KDHE says “last resort”
- Not currently practiced in the United States
  - Has been studied in CA, FL, CO
- Public health impacts
  - Pharmaceuticals, endocrine disruptors, personal care products
  - Nitrates
  - Viruses and pathogens

Wastewater Treatment Plant Upgrades

- Existing wastewater treatment plant
  - Secondary Treatment (trickling filters)
  - UV Disinfection
- For irrigation of low body contact areas (i.e. golf courses)
  - Likely no treatment improvements needed
- For irrigation of high body contact areas (i.e. athletic fields)
  - Add filtration
  - Likely need additional disinfection

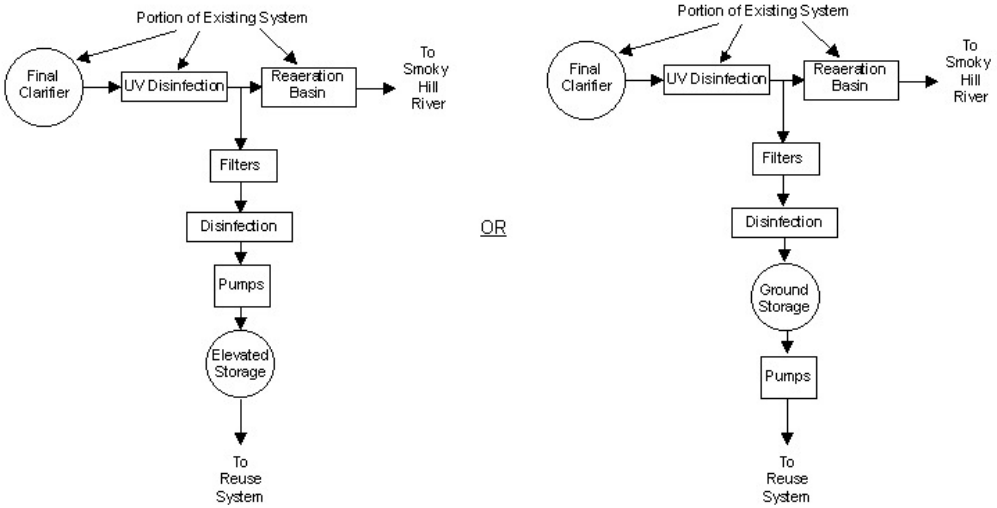
Other Infrastructure Requirements

- Pumping and storage
  - Irrigation occurs at night (public access restricted)
  - Flow into WWTP lowest
  - Store water for use during off-peak hours
- Pipeline to serve irrigation sites
  - 6.5 miles of pipelines



Cost Estimate for Upgrades

- Cost Estimate
  - General - $206,000
  - Filtration - $655,000
  - UV Disinfection - $524,000
  - Storage Tank/Pump Station - $500,000
  - Distribution Piping - $1,710,000
  - Contingencies (30%) – 1,079,000
- Total Construction Cost - $4,674,000
- Engineering, Legal, etc (20%) - $935,000
- Total Project Cost - $5,609,000



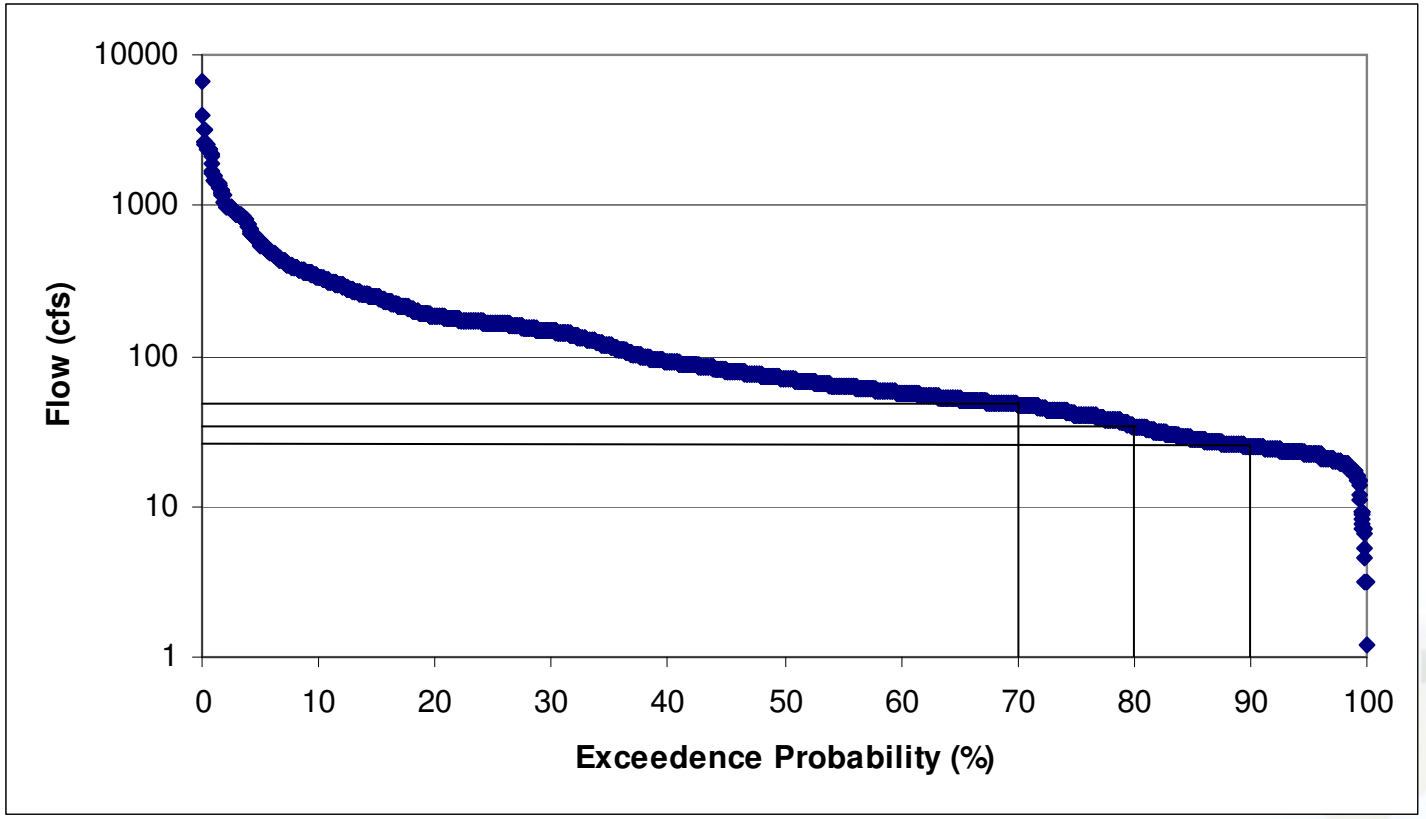
Discussion/Questions

Outcome of Water Conservation Measures Rating

Next CAB Meeting

- January 29, 2009 – 6:00 PM
- Meeting Topics
  - Water Supply Alternatives
    - New sources of supply
    - Identify alternatives
    - Evaluate alternatives

Discussion/Questions



Smoky Hill Flow Duration Curve, 2000 - 2006


Lincoln Center
Solomon River
Saline River
Abilene
70
Salina
Smoky Hill River
Ellsworth
Herington
Lindsborg
Smoky Hill River
135
McPherson

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